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TOXICITY OF $HgCl_2$ AND CH_3HgCl TO *CHLORELLA VULGARIS*

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KNOWLEDGE regarding the relative toxicity of metals to biota contributes towards our understanding of the hazards of metals pollution in aquatic ecosystem. Algae have been widely reported to concentrate metals in their system[1–3]. A few of the important references related to the problem are those of Bartlett and Rabe[4], and Hannan and Patouillet[5]. The effect of mercury on algal growth rates was observed by Hannan and Patouillet[5]. Rachlin and Ferran[6] pointed out the growth response of the green algae *Chlorella vulgaris* to selective concentration of zinc. In the present study we evaluate the ion of the LC_{50} of mercuric chloride ($HgCl_2$) and methyl mercuric chloride (CH_3HgCl) for unicellular algae *C. vulgaris* and the effects of these chemicals on the growth potential.

Stock culture of *C. vulgaris* was maintained in the basal Zarrouk's medium in corning conical flask of one litre capacity[7]. Both stock and experimental cultures were maintained under artificial lights. Inoculum was prepared from the stock cultures and grown in Zarrouk's medium for two days. When it attained an exponential growth stage, the culture was dosed with $HgCl_2$ and CH_3HgCl.

Experiments were carried out in screw cap bottles (corning 30 ml capacity), each set kept in triplicate and the whole experiments repeated twice. The cultures were exposed during the 24 h of the day to artificial light having intensity nearly 3000 lux unit. Growth of algae was measured taking optical density measurements in double cell colorimeter. Observations were made for 10 days.

Screening experiments were conducted to establish the toxicity ranges. The toxicity test range was between 0.022 mg/l and 0.122 mg/l for $HgCl_2$ and between 0.018 mg/l and 0.102 mg/l for CH_3HgCl. Exponentially growing culture was taken in the culture flask and dosed with the toxicant for the desired concentrations. The dosed cultures were then distributed in three screw cap bottles (30 ml capacity) and kept in identical conditions. Obser-

Table 1 *Toxic effect of $HgCl_2$ and CH_3HgCl on per cent mortality of Chlorella vulgaris*

Time (days)	% mortality in different concentrations of $HgCl_2$ (mg/l)							
	0.080	0.086	0.092	0.098	0.104	0.110	0.116	0.122
2	16	27	33	38	53	59	72	89
4	20	30	25	47	49	66	89	100
6	13	22	37	49	64	78	100	
8	19	27	50	57	70	90		
	% mortality in different concentrations of CH_3HgCl (mg/l)							
	0.066	0.072	0.078	0.084	0.090	0.096	0.102	
2	16	23	33	44	71	71	87	
4	23	19	26	38	60	75	100	
6	20	21	31	46	65	78		
8	18	23	39	50	65	79		

LC_{50} values 0.092 mg/l for $HgCl_2$ and 0.084 mg/l for CH_3HgCl.

Table 2 *Effects of $HgCl_2$ and CH_3HgCl on the growth potential of Chlorella vulgaris showing lethal response*

Time (days)	Optical density in different concentrations of $HgCl_2$ (mg/l)								
	Control	0.080	0.086	0.092	0.098	0.104	0.110	0.116	0.122
2	0.01	0.08	0.09	0.11	0.12	0.16	0.26	0.36	0.47
4	0.02	0.12	0.23	0.26	0.31	0.42	0.49	0.51	0.89
6	0.02	0.13	0.33	0.29	0.37	0.54	0.74	0.80	
8	0.01	0.11	0.36	0.34	0.43	0.77	0.80		

	Optical density in different concentration of CH_3HgCl (mg/l)							
	Control	0.066	0.072	0.078	0.084	0.090	0.096	0.102
2	0.01	0.03	0.03	0.06	0.08	0.11	0.13	0.36
4	0.01	0.05	0.05	0.11	0.23	0.31	0.37	0.64
6	0.01	0.04	0.08	0.28	0.35	0.46	0.062	0.80
8	0.01	0.10	0.11	0.33	0.53	0.62	0.80	

vations of all these three bottles were considered to evaluate the LC_{50} of these two compounds for *C. vulgaris*.

The biological changes and LC_{50} of $HgCl_2$ and CH_3HgCl to *C. vulgaris* are given in tables 1 and 2.

As *C. vulgaris* was introduced into the test solution, the colour changed. *C. vulgaris* was green in colour but on exposure to high concentration of $HgCl_2$ and CH_3HgCl, it became yellowish within 24 h.

This change in colour occurred in all the concentrations and the intensity of colour change varied in accordance with the test concentrations.

The LC_{50} values of $HgCl_2$ and CH_3HgCl were worked out as 0.092 mg/l and 0.084 mg/l respectively.

It was found that the growth of the culture in the concentration of 0.022 mg/l to 0.080 mg/l of $HgCl_2$ and 0.018 mg/l to 0.066 mg/l of CH_3HgCl is healthy. Gradual decrease in growth started at the concentration 0.0800 mg/l and 0.066 mg/l and 100% mortality occurred at 0.122 mg/l and 0.102 mg/l of $HgCl_2$ and CH_3HgCl respectively. In 0.080 mg/l, 0.086 mg/l and 0.092 mg/l of $HgCl_2$ and 0.066 mg/l, 0.072 mg/l and 0.084 mg/l of CH_3HgCl more than 50% of the inoculum died within 8 days (table 1). The remaining algae started growing exposed in first two concentrations. In 0.092 mg/l of $HgCl_2$ and 0.084 mg/l of CH_3HgCl, the initial inoculum died within 10 days. The remaining algae, however, could not grow any further and 100% mortality was found within 15 days of growth period. Therefore, 0.092 mg/l of $HgCl_2$ and 0.084 mg/l of CH_3HgCl appear to be the lethal level for *C. vulgaris*. The concentration of 0.022 mg/l to 0.080 mg/l of $HgCl_2$ and 0.018 to 0.066 mg/l CH_3HgCl can be denoted as algistatic, since inhibition in growth rate was obvious in these toxic ranges. This was confirmed by the revival test carried out in treated cultures. Treated culture were centrifuged and washed with distilled water and it was observed that the centrifuged algae recovered. The recovered algae were transferred to the conventional Zarrouk's medium. The recovered algae from 0.086 mg/l of $HgCl_2$ and 0.078 mg/l of CH_3HgCl could grow in conventional medium as in control. But the algae recovered from 0.092 mg/l of $HgCl_2$ and 0.084 mg/l of CH_3HgCl could not grow.

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